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A SURVEY OF BEEKEEPING IN NORTH CAROLINA.

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INTRODUCTION.

A survey of the State of North Carolina recently has been made in order to determine the present conditions, possibilities, and needs of the business of beekeeping, with special reference to the best means of supplying these needs. It seemed desirable to learn why North Carolina beekeepers are receiving relatively small returns, whereas there was a reason to believe that opportunities for profitable beekeeping were on every hand. This survey began October 1 and ended December 22, 1915.

In this survey, counties of Surrey, Henderson, Clay, Haywood, Jackson, Buncombe, Madison, Mitchell, McDowell, Iredell, Randolph, Forsyth, Guilford, Alamance, Pamlico, Beaufort, Pender, Washington, Martin, and Sampson were included.

The census figures for the year 1909 show 36,248 farms reporting bees, with a total number of colonies of 189,178, thus giving the State fourth rank for number of colonies in the United States. The honey produced was valued at $211,607 and the wax at $18,979, a total valuation of $230,586, which gives the State eleventh rank in

Note.—This bulletin treats particularly of beekeeping conditions in North Carolina, but is of interest to beekeepers generally.

The author wishes to express his appreciation to the beekeepers visited for many kindnesses, also to the county agents, who greatly facilitated the work by arranging for meetings of beekeepers. He also expresses his appreciation of the aid furnished by Prof. Franklin Sherman, jr., State entomologist, for data concerning beekeepers and for assistance in planning routes.

value of hive products. The State ranks second in value of wax produced. The value of bees per colony is reported at $2.04. Attention is called to the fact that these figures are not complete, as many of the bees in the State are not on farms and many on farms evidently were not reported.

In brief, the survey fully verifies Prof. Franklin Sherman's[1] statement that "there is perhaps no other industry in the State of equal importance, and with equal opportunities for development, which is so disorganized, so disconnected, and suffering so badly from lack of careful attention and better methods as is the beekeeping business."

No doubt bees have been in North Carolina for a long time, but the business of beekeeping has received so little attention that, except in a comparatively few cases, absolutely no advance has been made.

PRESENT CONDITIONS.

TYPES OF HIVES.

Most of the colonies of bees in North Carolina are housed in hollow logs or "gums." Some are kept in upright box hives, "plank" or "tall gums," and only a small percentage are in some type of movable-frame hive, locally called "patent gums." The eastern and western parts of the State have the largest percentage of bees in logs, while through the central part the majority of the bees are in movable-frame hives. This condition appears to be due partly to the fact that the beekeepers are slow to adopt new methods, particularly as in some cases movable-frame hives have been tried with poor results, owing to lack of knowledge necessary to get good returns. Beekeeping as practiced by most of the beekeepers is not profitable, and the present returns by the old methods are not sufficient to make obvious to them the desirability of an expenditure necessary to place the bees in movable-frame hives.

Some are using homemade hives with movable frames, and, where the hives are made with sufficient accuracy to insure proper spacing of the frames, they are giving satisfactory results. White pine of fair grade suitable for hives can be had at small cost in the western part and a soft cypress (white cypress) in the eastern part of the State. A considerable number of factory-made hives have been sent into the State, made of yellow pine of poor quality and with the frame spacing so inaccurate as to make proper manipulation impossible. Best results can not be secured with such equipment.

For the most part the population of North Carolina is scattered and transportation is poor; hence there is not the free interchange of ideas which occurs in sections where the population is dense.

[1] Sherman, Franklin, jr., 1908. Beekeeping in North Carolina. Bulletin of N. C. Dept. of Agr., vol. 29, no 1.

Knowledge of improved methods of beekeeping has not reached the majority of those owning bees. In case reports of good profits from bees elsewhere have been received, these have been so far above the amounts that are being secured by the old methods that the reports have met with little credence. In very few instances have efforts been made to secure like results.

RACES OF BEES.

Almost all the bees in the State are German (black) hybrids, practically none being found without some trace, however slight, of Italian blood. Numerous efforts have been made to improve the stock by introducing pure Italian queens, but, with few exceptions, this has produced bees which so vigorously resent disturbance that such attempts at improvement have been discouraged. Since the color of the bees in every case has been light yellow, it is quite likely that there has been some Cyprian blood in the stock secured. A few apiaries are stocked with Italians and an effort is being made to keep them pure—a rather difficult task, however, because of the presence of so many wild hybrid colonies.

One beekeeper had used a few colonies of Carniolan bees, but has discontinued beekeeping and no data are obtainable regarding their comparative value in North Carolina.

SHADE.

Shade for the hives, either natural or artificial, is considered by almost all beekeepers in North Carolina to be necessary to avoid melting of the combs in the summer. It would be unnecessary, however, were it not for the fact that the entrance in the log or plank "gum" consists merely of a few V-shaped notches or a small slot, entirely inadequate for proper ventilation of the hive in hot weather, This conclusion is supported by cases in the central and eastern parts of the State, where beekeepers have provided large entrances and have raised the hive from the bottom board to allow abundant bottom ventilation and have dispensed with shade without harmful results. The western part of North Carolina is mountainous and cooler in summer, making extra ventilation less important.

ARRANGEMENT OF HIVES.

In the western part of the State it is the custom to place the log or plank "gum" on long benches or on a flat rock, which rests on four stakes driven into the ground. In the eastern part, as rocks are not obtainable, benches only are used. If space will permit, the placing of hives in a single row close together is practiced. Perhaps 100 "gums" will be found in one row. Aside from using

natural shade when convenient, no attempt is made to locate the hives near natural windbreaks or to face them to any particular point of the compass.

SWARMING.

Uncontrolled swarming always results in a greatly reduced honey crop. A colony of bees kept together will store more surplus honey than will the same bees divided by swarming into two or more colonies, as each swarm must use a large amount of honey in order that they may construct combs for the new hive. This honey of course is lost to the beekeeper. Further, this division of the colony into two, or more, reduces the available force of field bees, since it is necessary that a certain number remain constantly in each hive properly to carry on the hive work. It is obvious then that when the bees are kept working together in one hive less are needed for inside hive work and more are available as gatherers.

With few exceptions, no effort is being made in North Carolina to prevent or to control swarming, and great numbers of swarms are annually lost to the beekeepers by flying to the woods. Further, many after-swarms issue, and this weakens the parent colony so that it not only can not produce surplus honey, but often it dies. Many of the weak after-swarms also die. In many cases the beekeeper has at the end of the season only the first swarm to show for his labor, no honey having been secured and both the old colony and the after-swarms having perished. Beekeepers boast of many colonies which cast three swarms, but with these results. It is obvious that under these conditions a good honey crop is impossible.

WAXMOTH.

While, as is well known, the larvæ of the waxmoth can do no damage in a strong, healthy colony of bees properly cared for, this enemy is recognized by all North Carolina beekeepers under different names, such as "weevil," "fly," or "worm." No adequate estimate can be made of the loss through its depredations, but it surely amounts to a large sum. Since the climate of North Carolina is not so rigorous as that farther north, the waxmoth has opportunities to work for a correspondingly longer period of the year. There is no climatic reason, however, why the ravages of this insect should not be stopped. The loss is due chiefly to excessive swarming, or, to be more explicit, to allowing after-swarms to issue. This is further aggravated by the great amount of German (black) blood in the bees, since it is generally admitted that black bees do not repel the waxmoth as do Italians.

DISEASE.

American foulbrood.—Samples of this disease were received by the Bureau of Entomology from Guilford County in 1911 and from

Madison, Mitchell, and Buncombe Counties in 1912. It was found that the sample from Buncombe County had been taken from a shipment of bees from Kentucky, in which the trouble was at once noticed and given radical treatment, and, so far as can be learned, the disease was entirely stamped out. In Guilford County the disease has been receiving careful attention. The beekeeper from whose yard the sample was sent has examined practically every colony of bees in the neighborhood and has found no disease except in his own apiary. There it has been so reduced that only two colonies showed infection in 1915 and in these it was light. The infection in Madison County is great and that in Mitchell County is considerable, and disease is spreading in both counties.

Sacbrood or "pickled brood."—This disease was observed in one case. Since even where some type of movable-frame hive is used examination of the brood nest is but little practiced, no definite idea of the extent of this disease can be formed.

Paralysis.—This condition was reported a number of times, and always by the better beekeepers. This does not indicate that it is absent where bees receive less care, but, it is believed, the less careful beekeepers fail to observe closely or else do not recognize the disease. In one yard of over 100 colonies the owner reports 50 per cent of the colonies affected by paralysis at some time during the season. The usual treatment is the sprinkling of sulphur on top of the frames and at the entrance, but with doubtful benefits.

WINTERING.

Perhaps no one thing connected with successful beekeeping is receiving as little attention in North Carolina as is protection for the bees in winter aside from that provided by the hive.

A study of weather records for Asheville from November 1, 1914, to March 31, 1915, shows that a daily variation in temperature of 20° F. is frequent. The maximum variation was 40°, which occurred once, and the minimum 2°, which occurred five times. The maximum temperature during this period was 62° and the minimum 4°. Five times during this period the temperature fell below 20°, twenty times below 25°, and forty times below 30°, or, on an average, below 30° once in three days. The figures for Wilmington are as follows: Maximum temperature, 76°; minimum temperature, 20°. Twice the temperature was below 25° and below 30° eight times. These two points are mentioned, as they probably represent the extremes of temperature in the State.

Only two beekepers in the State, so far as known, are providing protection for the bees in winter, and in these two cases it is slight. One beekeeper places an empty super filled with leaves over the brood chamber, and the other is using a hive which takes a super of

thin lumber inside an outer shell, and when the supers are removed the shell is filled with pine needles, locally called "pine straw."

There is considerable evidence of the value of the protection afforded by thick log "gums" in winter. This is to be expected, since all have walls 2 or 3 inches thick. When the subject of winter protection is mentioned, the North Carolina beekeeper states that the mildness of the climate makes extra protection unnecessary. Its value is apparent to the best beekeepers when it is shown that extra packing will keep the bees quiet during the season when no nectar can be gathered, since they all agree that bees expend too much energy needlessly during this period.

QUEEN REARING.

There are three queen-rearing apiaries in the State, with a total output of from 1,500 to 2,000 Italian queens annually. These queen-breeders produce light-colored bees. Queen-cells are started in the queenless side of a colony, divided by queen-excluding zinc. Both small twin mating-boxes and nuclei with full-size frames are used for mating queens.

TYPES OF HONEY.

There are five distinct types of honey produced in North Carolina, as follows: *Bulk comb-honey*, produced in shallow frames ($5\frac{3}{8}$ inches deep), is cut out and packed in 5, 10, and 15-pound tin buckets, with enough extracted honey added to fill up the spaces. Care is used to keep the queen out of the storage combs, in order that they may not be darkened by having bees reared in them. Combs containing pollen are not permitted in honey of this type. *Chunk honey* is produced in log or box "gums" and is "robbed" from the top of the hive in irregular chunks after the "head" or top of the "gum" has been removed. Frequently the comb has been darkened and toughened by having brood reared in it, and much pollen—"beebread"—finds its way into this product. No regular size or shape of package is used for this type of honey, the customer usually furnishing the container. *Comb-honey*—"section or box honey"—is produced in the commercial section, locally known as honey box or pound section. *Extracted honey* is stored in either deep or shallow frames and is removed by the honey extractor and packed in 50-gallon barrels. Honey in this form is secured unmixed with pollen or other foreign substances. *Strained* or "*squeezed*" *honey* is stored by the bees in the log or plank "gums," the honey being obtained by killing the bees with sulphur fumes, cutting the combs from the hives, and at once mashing up the combs and putting the mass in a thin cloth sack, so that the honey can drip out. Sometimes the cappings are

removed from the combs, which are placed in a slanting trough, and, after some of the honey has dripped from the combs, the residue is pressed to remove the remainder of the honey. The resulting product contains considerable pollen and other foreign substances. It must not be thought that extracted and strained or squeezed honey are the same; neither are bulk comb-honey and chunk honey identical.

SIZE OF CROPS.

The number of beekeepers of all classes whose methods have been studied is sufficient to indicate the amounts of honey in the different forms now secured by those who are really giving the bees some chance to do what they can. The average amount of comb-honey in sections is given at 40 pounds per colony. The amount secured in the eastern part of the State by extracting averages 60 pounds. The data regarding strained or squeezed honey were somewhat indefinite, being given as 2½ to 6 gallons or 30 to 72 pounds per "gum." This includes of course the entire amount of honey in the hive when the colony is killed. It is possible that the custom of killing the bees and taking the honey in the full moon in June may result in a smaller amount being secured than if the killing were left until gathering had ceased in the fall. The average production of bulk comb-honey per hive is given as 50 pounds. These figures are all conservative, being based on a series of years including good and poor seasons. Mention may be made of the production of 10 gallons of squeezed honey, 120 pounds of bulk comb-honey, or 150 sections by a single good colony in good seasons, but while these amounts have been secured in good seasons, the figures given previously are being duplicated annually.

BEESWAX.

No effort is made to secure all the wax from old combs and only the crudest methods are used in rendering. No wax-press was seen which was capable of sufficient pressure to get most of the wax; in fact the only press used is made of two pieces of lumber hinged at one end. The free ends are brought together while the sack containing the hot material is between the sticks near the hinged end. The wax produced in all parts of the State is small in quantity, due to inefficient methods of rendering, but it is of good quality and free from foreign matter.

Although the State ranks second in the amount of wax produced, this should not be considered as a favorable condition, since it results from the practice of killing bees to get the honey. With good beekeeping the destruction of combs in this way will not be practiced, but the total output of wax will probably not be decreased if better methods of rendering are employed.

VALUE OF HONEY AND WAX.

The prices received by the beekeeper for honey and wax in North Carolina have a wide range. In some localities and for some honeys the prices are good, as compared with prices in other parts of the United States; in other places they are entirely too low. The type of honey and care used in production are important factors in regulating the price, but in some cases no good reason for the low prices can be given, except lack of organization and distribution. Failure to learn the market value is probably the cause of the low prices obtained for beeswax in the western part of the State and for comb honey in the eastern part.

Bulk comb honey and chunk honey, which are the common types in the western and central parts of the State, have been sold in recent years by the beekeepers at 12½, 15, and 20 cents a pound, depending on the quality; 20 cents has been the common price for sourwood or other light-colored and mild-flavored honeys, such as basswood. Section comb honey in the western and central parts has brought the producer 15 to 20 cents a section, while in the eastern part only 10 cents a section is secured, although the product is good in color and finish. Extracted honey in 50-gallon barrels frequently sold for 7½ to 8 cents a pound, while strained or squeezed honey, the production of which is principally in the east, commanded the lowest price—around 40 cents wholesale and about $1 a gallon retail.

The price of beeswax also has a wide range, and, singularly enough, it is just the reverse of honey prices; the lowest, 20 cents a pound, is paid the producer in the western part of the State and 28 to 32 cents in the eastern part.

MARKETING HIVE PRODUCTS.

No more encouraging features can be mentioned than the eagerness of the market for honey, particularly through the central and western parts of the State, and that bulk comb honey has a ready sale at good prices. The markets in these localities prefer honey in this form. While producers in the eastern part received last fall only 10 cents a section for their product, comb honey by the carload came into the central part of the State from the west, and also some from Tennessee and Georgia. With proper distribution, the eastern producer could secure at least 15 cents a section for his product, which is the price received for the honey from outside sources.

Little honey is shipped from North Carolina. From the east some comb honey goes to Norfolk and some extracted and strained honey is shipped to New York, but the consumption of honey in the State is far above the local production, and the demand is therefore not supplied.

The survey indicates that the demand for sourwood honey will continue to be much above the supply for a long time, as it has the preference locally over any other kind. When its qualities become known beyond the locality of production, the demand may be greatly increased.

PROFITS OF BEEKEEPER.

The receipts from a colony of bees range from nothing to $20 or more per year. Such a statement only shows what such combinations as a good beekeeper and a good season on the one hand, or a poor beekeeper and a poor season on the other, will do.

Careful inquiry and investigation of the amounts of honey secured and the prices obtained by the best producers of the different types of honeys show that the receipts per colony from the production of comb honey is $5; of extracted honey, $4.50; of strained honey, $2.50; of bulk comb honey, $7.50. It is well to bear in mind that these returns are obtained only by those who are giving bees considerable attention. Hundreds of those having bees are receiving almost nothing from them, except a little honey of inferior quality for home use.

PROPOLIS.

The propolis in the swamp district of North Carolina is gray, does not stain the section, is not abundant, and is easily removed, all of which favor comb-honey production. It is reported that this propolis is gathered from sweet gum (*Liquidambar styraciflua*), and when chewed it resembles chewing gum.

LITERATURE.

Few of the beekeepers of North Carolina are making good use of the available bee literature; in fact, few have a book on beekeeping or read a bee journal.

In 1908 Sherman issued a stimulating bulletin[1] which was rather widely distributed among the beekeepers. This, so far as known, is the only publication dealing specifically with the problems of the North Carolina beekeeper.

BEEKEEPERS' ASSOCIATIONS.

A few years ago there was a small society of beekeepers in the western part of the State, but no definite data on the present status of the association could be secured. Inquiry also reveals a desire among the more advanced beekeepers for a State organization of beekeepers so that meetings can be held and their peculiar problems dis-

[1] Sherman, Franklin, jr., 1908. Beekeeping in North Carolina. Bulletin of N. C. Dept. of Agr., vol. 29, no. 1.

cussed. No doubt such an organization easily could be effected. The length of North Carolina and the slowness of travel from east to west would make it desirable to have some agreement whereby the meetings could alternate between the eastern and western parts of the State.

ATTITUDE OF BEEKEEPERS TOWARD IMPROVED METHODS.

One of the hopeful signs, if not the most hopeful one, is the attitude of the beekeepers toward improved apparatus and methods. There is not the self-satisfied attitude which is often met elsewhere and which is so impossible to overcome. There was shown an eagerness to learn and to make use of the information in cases where certain simple manipulations have been explained.

FOLKLORE.

Superstitions regarding bees which formerly were common, such as ringing bells or beating pans to cause a swarm to settle, "telling the bees" when their owner dies so they will not also die, and a belief that selling bees brings bad luck, were encountered, as well as some which were not so common. Some beekeepers will not count the hives for fear of ill luck. It is said by the superstitious that on Washington's birthday all the hives must be slightly moved to ward off ill luck. Bees are "robbed" by killing the bees at the time of the full moon in June, as it is believed there is then little "beebread" in the hive. These superstitions will, of course, disappear with better beekeeping.

HONEY PLANTS.

Sherman already has listed the main honey sources, although probably gallberry should have been given more prominence for the eastern part of the State bordering on the swamps and streams.

From the standpoint of nectar-producing flora and consequent manipulations the State may be divided into three parts—western, central, and eastern—without definite boundary lines. The leading honey plants in these three sections are sourwood, clovers, and gallberry, respectively. Tulip poplar, or "poplar," is purposely omitted, for, although it is abundant and is a good nectar producer, honeys from the sources mentioned above are superior and bring a higher price than does that from tulip poplar. It is believed that the beekeeper will do well so to manipulate his colonies that they will consume the honey from this source in breeding and thus attain greater strength for gathering the more desirable later honeys.

All through the mountainous and upper Piedmont sections of the State sourwood flourishes and is still abundant enough, in spite of cutting, to be the leading surplus honey plant. Going eastward, because of the increased clearing of land for agricultural operations

sourwood gradually becomes less and clovers, particularly crimson clover, become more plentiful. Still continuing eastward, the cotton belt is reached, which is perhaps the poorest honey-producing region in the State. Although cotton is reported as a honey plant, there is no definite information concerning this, and the fact that there are less bees in this part of the State than in any other is further indication that this region is the least favorable for bees. This condition, however, will probably be improved by the more extensive use of crimson clover as a cover-crop and the introduction of alsike clover. After the cotton belt is passed, the low-lying lands bordering the coast and rivers are reached, with immense areas of gallberry and black and tupelo gum, producing delicious honey in abundance.

Honeydew is often reported, but data on this are very unsatisfactory, some reporting it as appearing in February.

Sourwood (*Oxydendrum arboreum*).—Sourwood is a rather scraggy tree of varying height, seldom exceeding 30 feet. It blossoms profusely in July, and under favorable circumstances nectar is produced in such abundance that it can not possibly all be gathered. Nectar may be dashed out by striking a bunch of blossoms in the palm of the hand. In addition to the quantity, sourwood has paramount qualities from almost every viewpoint. The honey is light in color, dense, of delicious flavor, and slow to granulate. Coming as it does about July 1 to 21, ample opportunity is given the beekeeper to prepare his colonies for best work on it. Compared with some other honey-producing plants, the season is short, but by good management there is no difficulty in securing a paying crop in the blooming period.

Linden (*Tilia sp.*).—The well-known basswood or linn is not abundant in the State, but is found in sufficient abundance in the north coves of the mountains to be of value to near-by beekeepers. In locations where the Federal authorities control the cutting of timber, the danger of the entire removal of the basswood is reduced. The honey from this source is light in color, of good body, and has a flavor which is generally liked.

Tulip poplar or poplar (*Liriodendron tulipifera*).—Tulip poplar has a wider distribution than any other source of honey in North Carolina, and it is unfortunate that the honey is dark, so that it does not command a high price. However, the honey from this source can be utilized to increase the output of honey secured from better sources. This tree is found in all parts of the State except in the lowlands of the east. It blooms from May 10–30, varying somewhat with differences in altitude.

Clovers (*Trifolium* spp.).—Although a number of honey-producing clovers are found in the State, crimson clover (*Trifolium in-*

carnatum) is of most value as a source of nectar at present. This plant is used both as a cover crop and for forage and its use is increasing. There are two varieties used, one having crimson and the other white blossoms, the crimson blooming about 14 days before the white.

Besides crimson clover, there is being introduced a considerable amount of alsike clover (*T. hybridum*) which will increase the honey crop. There is also white sweet clover (*Melilotus alba*) in a few places, but not yet enough to be of value.

Gallberry (*Ilex* spp.).—Bordering on the swamps and rivers of the east are thousands of acres of gallberry which produces an abundance of nectar, the honey being light in color and of good body and flavor. It is reported that bees do not work on the blossoms of this plant before 10 o'clock in the morning. The blossoming period is given as May 10 to June 5.

Black and tupelo gum (*Nyssa* spp.).—Black gum is abundant from the center to the eastern part of the State and is credited with much good honey. Tupelo gum (*Nyssa aquatica*) is confined principally to the southeast and is an important honey plant.

Besides the above-mentioned sources of nectar, there are a number of plants and trees of value to the beekeeper because of the pollen or nectar which they produce. A list is here given but no claim is made for its completeness. Cotton may also become important as a honey producer, as is reported to be the case farther south. However this may be, there are sufficient pollen and nectar producing plants in the State, with the possible exception of the cotton belt, to make beekeeping profitable to the person who engages in beekeeping commercially.

PLANTS REPORTED AS VALUABLE TO BEEKEEPERS.

Elm (*Ulmus* sp.): Pollen; February; Piedmont section and eastern part of North Carolina.

Alder (* *Alnus rugosa*): Pollen; specimen from Surry Co.; February; throughout State.

Maple (*Acer* spp.): Pollen and nectar; March; throughout State.

Wild plum (* *Prunus angustifolia*): Nectar; specimen from Surry Co., March; western part of North Carolina.

Willow (*Salix* sp.): Pollen and nectar; April; throughout State.

Deciduous fruit: Pollen and nectar; April; throughout State.

Redbud (*Cercis canadensis*): Nectar; April; Piedmont section and western part of State.

Black gum (*Nyssa sylvatica*): Nectar; April; Piedmont section and eastern part of State.

Holly (*Ilex opaca*): Nectar; April; Piedmont section and eastern part of State.

Rattan (* *Berchemia scandens*): Nectar; specimen from Pamlico Co.; May; extreme eastern part of State.

Locust (*Robinia pseudacacia*): Nectar; May; western part of State and Piedmont section.

Crimson clover (*Trifolium incarnatum*) : Nectar; May; Piedmont section.

Huckleberry (*Gaylussacia* sp.) or Blueberry (*Vaccinium* sp.) : Nectar; May; eastern part of State.

Tupelo gum (**Nyssa aquatica*) : Nectar; Specimen from Pender County; May; extreme eastern part of State.

Wild blackberry (*Rubus* spp.) : Nectar; May; west and Piedmont.

Tulip poplar, locally called poplar (*Liriodendron tulipifera*) : Nectar; May 10–30; throughout, except in extreme eastern part of State.

Pasture killer, "rubber weed" (**Senecio aureus*) : Nectar; specimen from Clay Co.; May; western part of State.

Highland gallberry (**Ilex glabra*) : Nectar; specimen from Pamlico Co.; May 15–June 20; eastern part of State.

Swamp gallberry (**Ilex coriacea*) : Nectar; specimen from Pamlico Co.; May 15–June 20; eastern part of State.

Persimmon (*Diospyros virginiana*) : Nectar; June; throughout State.

White clover (*Trifolium repens*) : Nectar; June–July; western part of State.

Sweet bay (**Persea pubescens*) : Nectar; specimen from Pamlico Co.; June; eastern part of State.

Linden, basswood, or linn (*Tilia* sp.) : Nectar; July; north coves of mountains.

Sourwood (** Oxydendrum arboreum*) : Nectar; specimen from Surry Co.; July 1–21; Piedmont region and western part of State.

Rattleweed, black cohosh (**Cimicifuga racemosa*) : Nectar; specimen from Buncombe Co.; July–August; western part of State.

Hercules club (**Aralia spinosa*) : Nectar; specimen from Washington Co.; June–August; eastern part of State.

Sumac (*Rhus* spp.) : Nectar; **Rhus glabra* from Surry Co., *Rhus copallina* also common; July; throughout State.

Smartweed (*Polygonum* and *Persicaria* spp.) : Nectar; specimen of **Persicaria pennsylvanica* from Henderson Co.; August–September; Piedmont region and western part of State.

Coralberry, Indian currant, buckbush (**Symphoricarpos orbiculatus*) : Nectar; specimen from Alamance Co.; July.

White snakeroot (**Eupatorium urticaefolium*) : Nectar; August; specimen from Buncombe Co.

Goldenrod (*Solidago* spp.) : Nectar; **Solidago altissima* from Henderson Co.; September; throughout State.

Asters, ironweed (*Aster* spp.) : Nectar; **Aster ericoides* from Surry Co.; September 20 to frost; throughout State.

Spanish needle (*Bidens* spp.) : Nectar; **Bidens vulgata* from Henderson Co.; September; Piedmont region and western part of State.

Stickweed, feather-edge (**Ridan alternifolius*) : Nectar; specimen from Buncombe Co.; August and September; throughout State.

POSSIBILITIES UNDER NORTH CAROLINA CONDITIONS.

The possibilities for commercial honey production are already great and there is opportunity for them to become greater. Increase in the area of land under cultivation will perhaps decrease the amount of honey secured from some sources but, to offset this, are the activities of the county agents and farmers who plan greatly

* Specimens of these plants were kindly determined by Mr. P. L. Ricker, Bureau of Plant Industry.

to increase the planting of clovers, both as cover crops and for forage, and this naturally would result in an increase in the quantity and also in some places the quality of the honey crop. The total sum of increased revenue to the State which would accrue from the use of better methods, apparatus, and stock is so great that quite naturally the average beekeeper does not credit it. Fortunately the returns of a few of the better beekeepers are known, so as to permit a fair estimate of the possibilities, and some cases will be cited.

In the northwestern part of the State a man and his son operating about 500 colonies in three apiaries secure an average income per colony of $5.60 from bulk comb-honey. In Iredell County, from 47 colonies in 1913, a beekeeper received $663 for his crop of bulk comb-honey. Near the center of the State a beekeeper started the season of 1915 with 80 colonies, increased to 125, and secured 5,000 pounds of bulk comb-honey, for which he received more than $600. In the southeastern part of the State in 1914 a producer owning 150 colonies secured 21 fifty-gallon barrels of extracted honey, selling for nearly $900. In Alamance County 23 colonies in 1915 produced section comb-honey yielding nearly $9 per colony, and the care given was practically nothing, except to hive swarms and to put on and remove supers.

Many cases like the foregoing may be cited, but these indicate the possibilities, except that it must be borne in mind—and this is said with no thought of disparagement—that these beekeepers, without exception, are making some error in their work. They fail to use full sheets of foundation, fail to control swarming, use inferior stock, or neglect to give extra winter protection to the hive, all of which reduce the production per colony, so that the figures given above do not indicate the maximum which it is possible to obtain.

It is also possible for those in the western part of the State to secure at least the usual market price of 28 cents instead of 20 cents a pound for their beeswax, and those in the eastern part who are now receiving but 10 cents for their section comb-honey to receive at least 15 cents, the usual market price for this grade of honey.

To show the possibilities more fully, the errors of a few of the best beekeepers will be pointed out in detail. The best bulk comb-honey producer visited does not have his colonies as strong as would seem possible under the existing conditions of the nectar supply, and the resultant yield is lessened. He does not give any extra winter protection and this decreases the crop. The most successful comb-honey producer visited does not use full sheets of foundation in the brood-chamber, consequently enormous numbers of drones are uselessly reared and fed to the detriment of the working force of the colony, and the surplus honey crop is reduced. He

is using only one shallow hive-body for brood-rearing, hence swarming is excessive, and it is impossible to rear in such a hive a colony of bees which will get the greatest amount of surplus honey. The crop of the extracted honey producer is reduced not less than 10 per cent because of drone comb in the brood chamber, from a failure to use full sheets of foundation or to sort combs. In neither case is winter protection given. It is impossible to estimate the loss sustained by the producer of chunk honey, since no effort is made to control swarming and the bees use up an enormous amount of energy in this profitless way. However, the bees in the log "gums," because of the thickness of the walls of the hive and the abundant stores, have better winter protection than bees in any other type of hive used in North Carolina.

The inadequate census figures for the year 1909 give the total colonies of bees on farms in North Carolina as 189,178. This, however, is far below the total number in the State. Estimating the average production of 10 pounds a colony at the conservative figure of 12½ cents a pound, the present annual income from honey is $236.472. Increasing this to the conservative estimate of 50 pounds a colony, the average production of the better beekeepers, gives an annual estimated increased production of 7,567,120 pounds, or an increase in revenue of $945,890. It is difficult to estimate the increased revenue which would accrue from proper rendering of wax and from stopping the loss occurring through the depredations of the waxmoth.

Again, using the census figures for 1909, the annual output of wax is given as two-fifths of a pound per colony. With the adoption of wax-rendering methods now used by the better beekeepers, the output of wax per colony would be doubled, making the increased revenue from this source $18,979. However, with other beekeeping methods, the production of wax may decrease, as it has elsewhere. This amount added to the estimated increase from honey makes $964,869. It is obvious, therefore, that with proper encouragement and direction the beekeeping industry of the State could in a few years be increased $1,000,000 annually.

The estimate given above is based on the number of bees now in the State according to the census figures. It is possible also to add to these numbers by more thorough stocking of the field, as tons of nectar are going to waste annually. Near the center of Alamance County, for instance, in the neighborhood of Mebane, there are about 100 colonies, and Mr. E. C. Turner, county agent for the southern half of the county, who is himself a beekeeper, reports that practically no bees are kept until the extreme southern end of the county, 20 miles away, is reached.

NEEDS OF THE BEEKEEPING INDUSTRY IN NORTH CAROLINA.

The greatest need of North Carolina beekeepers is an insight into late and improved methods of beekeeping. The majority of beekeepers in the State have not had the opportunity, either by personal contact with efficient beekeepers or from literature, to learn profitable methods of managing bees. Education in managing bees is needed to secure the greatest amount of honey and wax in the best condition for the market, thus giving the greatest returns to the producer.

SUMMARY.

A careful study of the situation and interviews, not only with all types of beekeepers but with those who are striving to introduce methods for greater production and better distribution in other branches of agriculture, indicate that the plan which gives most promise for meeting these needs is through personal contact of an enthusiastic, expert beekeeper.

Personal contact is necessary, since few beekeepers in the State have learned the elementary principles of beekeeping and have a foundation on which to build successfully. Therefore it is necessary, at the beginning, to meet beekeepers personally, to learn their difficulties, to discover their errors, and to suggest the proper management. There is not the confidence in beekeeping as a source of revenue which is necessary for good results; hence enthusiasm must be aroused, and this is not done sufficiently through the printed page. The manner, then, of supplying this need is through an expert beekeeper who will work largely on the lines followed by the farm demonstrators, not hesitating, however, to adopt other methods which may present themselves to further the work.

North Carolina has a large number of bees. The pollen and nectar-producing flora of the State is abundant and the honey, when properly produced, is of high grade. There is a good market in the State for honey. Many more bees profitably could be kept in the State. Beekeeping is a business which, when well managed, gives quick and excellent returns. The beekeepers of North Carolina are now in the proper attitude to accept and make the best use of information which will enable them to secure good profits from the bees. In view of these facts it is highly desirable that extension work in beekeeping be inaugurated as quickly and carried on as vigorously as circumstances will permit.

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